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Measles and Its Association with Blood, Organ Functions, and Growth in Children

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Measles is a febrile illness with a systemic rash disease vaccine. It raises morbidity and mortality rates globally even though a safe and efficient live attenuated vaccine is available. To evaluate the impact of measles on blood cell composition, liver and kidney functions, physical growth, and nutritional status in children during the first 14 days of infection. A cross-sectional observational study was conducted in Al-Rifai Teaching Hospital during the period from April to October 2024. The study included a convenient sample of 50 children under the age of 10 years who were diagnosed with measles. The data was collected by the researcher during the first 14 days of infection and included complete blood count, liver function test, renal function, anthropometric data measurement, and vaccination status. Regarding the haematological parameters, 24 (48%) of the patients had a low WBC count, 12 (24%) had low Hb, and 7 (14%) of them had a low platelet count. About the liver and renal function, 5 (10%) of the patients had elevated GOT, 3 (6%) had elevated GPT, 2 (%) had elevated blood urea, and 7 (14%) of them had elevated serum creatinine. Measles significantly impacts blood cell composition, liver function, and nutritional status in children. The findings underscore the importance of vaccination and the need for nutritional support during and after infection to minimize complications.

Keywords : Measles, Blood Cell Composition, Liver Function, Nutritional Status

PENDAHULUAN

Covid Measles is a highly contagious and deadly infectious disease caused by an RNA virus that is part of the paramyxoviridae family[1, 2]. While the disease's incidence and mortality significantly decreased between 2000 and 2016, the global measles rebound that started in 2017–2018 persisted in 2019 and represented a major setback in the effort to eradicate measles worldwide[3]. In 2021, approximately 128,000 people worldwide died from measles, with the majority of those deaths occurring in children under the age of 5 who were either unvaccinated or not fully vaccinated[4]. In Iraq, over the past 50 years, 1,331,021 cases of measles have been reported, with an average of 25,114 cases and 750–1250 deaths each year. Although great efforts are being made to eradicate measles, isolated outbreaks and occasional cases still happen[5]. The measles virus enters the body through the respiratory system, quickly travels to lymphoid tissue, and has a significant impact on the immune system both immediately and over time[6, 7]. Measles is a febrile illness with a systemic rash disease vaccine[6], it is characterized by a generalized maculopapular skin rash, fever above coryza, cough, 38.3°C, and/or conjunctivitis[8, 9]. Globally, measles increases morbidity and mortality even though a safe and effective live attenuated vaccine is available[8, 10]. The World Health Organization advises that routine immunization programs should include two doses of the measles-containing vaccine[11]. The epidemiology of measles has changed as a result of vaccination. More than 95% of kids were infected and immune to measles during the first 15 years of age in the past. Anyhow, measles is rare in well-vaccinated communities in the vaccination era, and when it does occur, it is more likely among adults[12]. In 2022, around 83% of children worldwide received their first dose of the measles vaccine by their first birthday through regular healthcare services, according to the World Health Organization[4].

Aim of the study: To evaluate the impact of measles on blood cell composition, liver and kidney functions, physical growth, and nutritional status in children during the first 14 days of infection.

PATIENTS AND METHOD

A cross-sectional observational study was conducted in Al-Rifai Teaching Hospital during the period from the 1st of April to the 1st of October 2024. The study included a convenient sample of 50 children under the age of 10 years who were diagnosed with measles. Patients with previous chronic haematological, liver, or renal diseases and those with growth disorders were excluded from the study. The data was collected by the researcher during the first 14 days of infection and included complete blood count, liver function test (serum glutamic oxaloacetic transaminase (GOT), glutamic pyruvic transaminase (GPT) and total serum bilirubin (TSB)), renal function tests (blood urea and serum creatinine), anthropometric

data measurement of weight and height and subsequent calculation of the body mass index (BMI), and vaccination status. The BMI was calculated according to the formula: weight (Kg) / (height (m))2[13]. The World Health Organization Standard Age and Sex-Specific Growth Reference charts were used for defining underweight, normal weight, overweight, and obesity[14]:

Ethical consideration: A written informed consent from the parents of patients. Approval was obtained from Al-Rifai Teaching Hospital Ethics Committee.

Statistical analysis: Microsoft Excel 2016 and the Statistical Package of Social Science version 26, were used for data entry and analysis. The categorical data was presented as frequencies and percentages while the continuous data were presented as mean ±standard deviation (SD). The t-test was used to test the significance of the difference between groups. A P-value of ≤ 0.05 was considered statistically significant.

RESULTS

A total of 50 patients were enrolled in the current study, more than half of them (54%) had an age of 1-5 years. Females constituted about three-quarters of the sample (74%)). As shown in table 1.

Table 1. The age and sex of the patients in the current study

Sociodemographic characteristics		N (%)
Age group (years)	<1	1 (2.0)
	1-5	27 (54.0)
	6-10	22 (44.0)
Sex	Female	37 (74.0)
	Male	13 (26.0)

Most patients (78%) were unvaccinated with the measles vaccine, as shown in figure 1.

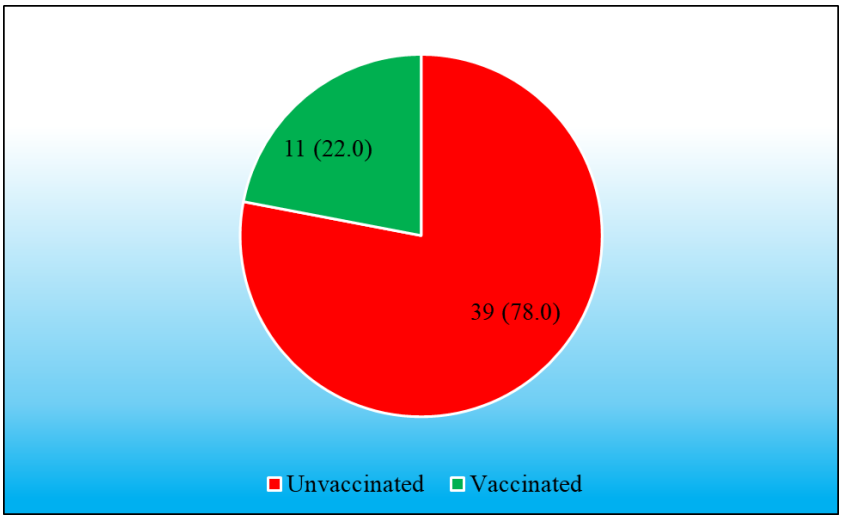

Figure 1. Distribution of the patients according to the vaccination state

About 21 (42%) of the patients were underweight as shown in figure 2.

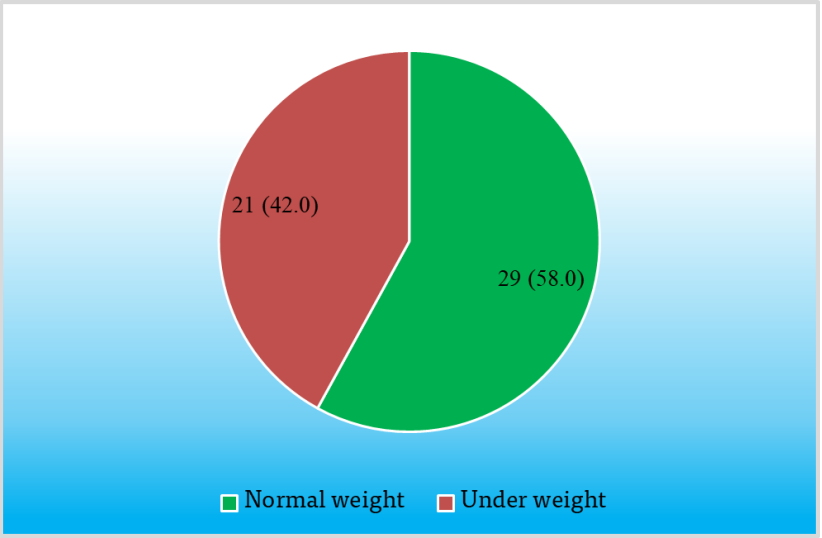

Figure 2. Distribution of the patients according to the body mass index categories

Regarding the haematological parameters, 24 (48%) of the patients had low WBC count, 12 (24%) had low Hb, and 7 (14%) of them had low platelet count as shown in table 2.

Table 2. Hematological results of the patients

Complete blood count		N (%)
WBC count	Low	24 (48.0)
	Normal	24 (48.0)
	High	2 (4.0)
Neutrophils	Low	0 (0.0)
	Normal	100 (100.0)
	High	0 (0.0)
Lymphocytes	Low	0 (0.0)
	Normal	100 (100.0)
	High	0 (0.0)
Hb	Low	12 (24.0)
	Normal	38 (76.0)
	High	0 (0.0)
Platelets count	Low	7 (14.0)
	Normal	43 (86.0)
	High	0 (0.0)

About the liver and renal function, 5 (10%) of the patients had elevated GOT, 3 (6%) had elevated GPT, 2 (%) had elevated blood urea, and 7 (14%) of them had elevated serum creatinine (Table 3).

Table 3. Liver and renal function test of the patients

Complete blood count		N (%)
GOT	Normal	45 (90.0)
	High	5 (10.0)
GPT	Normal	47 (94.0)
	High	3 (6.0)
TSB	Normal	100 (100.0)
	High	0 (0.0)
Blood urea	Normal	48 (96.0)
	High	2 (4.0)
Serum creatinine	Normal	43 (86.0)
	High	7 (14.0)

There were no significant associations between the gender and haematological results, renal function test, and liver function test as shown in table 5.

Table 5. Association between gender and haematological, renal and liver tests

Complete blood count	Female Mean ±SD	Male Mean ±SD	P-value
WBC count	6.35 3.5	7.69 3.1	0.230
Neutrophils	3.75 1.6	4.92 2.3	0.061
Lymphocytes	1.99 1.6	2.21 1.1	0.656
Hb	12.24 1.4	11.60 1.1	0.151
Platelets count	216.16 131.4	260.15 63.1	0.254
GOT	27.46 13.1	27.54 11.5	0.985
GPT	20.59 14.4	22.62 5.9	0.629
TSB	0.60 0.1	0.54 0.1	0.293
Blood urea	26.32 7.0	25.23 4.7	0.605
Serum creatinine	0.78 0.1	0.76 0.1	0.535

DISCUSSION

Acute systemic viral infections like measles have interactions with the immune system that are crucial for various illness stages[15]. This study was one among others that tried to assess the complications of measles in different body systems. In the current study, only one patient had an age of < one year and about three-quarters of the patients were female. The disease was nearly equal in males (51%) and females (49.3%) in another study that was done [16]. In contrast, the incidence of measles was higher in males than in females in another study that was done [17]. Regarding age, the same results were obtained in another study that was done [18]. This discrepancy might related to differences in the risk factors in different

populations. About 22% of the patients in the current study were vaccinated before infection. In comparison, 32% of the patients with measles were vaccinated in another study that was done [19]. More than two-thirds of the patients in the current study were underweight. In the same line, Isabelle et al. postulated an interactive association between measles and malnutrition and emphasized the necessity of delivering malnutrition therapies and measles prevention and control through an integrated approach [20]. The current study revealed that nearly half of the patients had low WBC, bout 24% had low Hb, and about 14% had low platelet count. In comparison, among the 112 patients with measles, 27 patients had a lowered WBC count, while 12 had an increased WBC count during the acute phase as revealed in another study that was done in China [21]. Only minority of the patients in the current study had abnormal liver and renal function test. In another study that was done in China by TU et al., 56 out of 112 patients had liver injury during the acute phase of infection which suggested that the use of antipyretic treatments might be the cause of liver injury as there was no other clear association [21]. Jennifer et al. reported that measles is rarely complicated by renal involvement [22]. The platelet count was significantly lower among vaccinated patients than unvaccinated patients. With an incidence of 0.087-4 per 100,000 doses, the measles-mumps-rubella vaccination is currently the only vaccine that has a cause-and-effect association with immune thrombocytopenia [23].

CONCLUSION AND RECOMMENDATIONS

Measles significantly impacts blood cell composition, liver function, and nutritional status in children. The findings emphasize the value of vaccination and the need for nutritional support during and after infection to minimize complications. We recommend implementing routine nutritional assessments for children diagnosed with measles to identify and address malnutrition early.

REFERENCES

[1] Andonova, “A Review of Measles Virus,” Probl. Infect. Parasitic Dis., vol. 49, no. 2, pp. 5–11, 2021.

[2] N. S. Crowcroft et al., “The Problem with Delaying Measles Elimination,” Vaccines, vol. 12, no. 7, p. 813, 2024.

[3] M. K. Patel et al., “Progress Toward Regional Measles Elimination - Worldwide, 2000–2019,” MMWR Morb. Mortal. Wkly. Rep., vol. 69, no. 45, pp. 1700–1705, 2020.

[4] World Health Organization, “Measles,” 2023. [Online]. Available: https://www.who.int/news-room/fact-sheets/detail/measles

[5] A. W. Jawad et al., “Epidemiological characteristics of Under Five Measles cases, Al Najaf Al Ashraf

Province, Iraq, 2006–2018," Kufa J. Nurs. Sci., vol. 11, no. 1, pp. 75–82, 2021.

[6] D. E. Griffin, "Measles immunity and immunosuppression," Curr. Opin. Virol., vol. 46, pp. 9–14, 2021.

[7] B. M. Laksono, R. D. De Vries, S. McQuaid, W. P. Duprex, and R. L. De Swart, "Measles virus host invasion and pathogenesis," Viruses, vol. 8, no. 8, p. 210, 2016.

[8] P. A. Gastañaduy et al., "Measles in the 21st century: progress toward achieving and sustaining elimination," J. Infect. Dis., vol. 224, Suppl. 4, pp. S420–S428, 2021.

[9] T. Goyal, A. Varshney, and R. K. Singh, "Poxviruses, Rubella, Coxsackie, and Comprehensive Approach to Infections in Dermatology," Comprehensive Approach to Infections in Dermatology, p. 260, 2016.

[10] A. Misin et al., "Measles: an overview of a re-emerging disease in children and immunocompromised patients," Microorganisms, vol. 8, no. 2, p. 276, 2020.

[11] World Health Organization, "Measles vaccines: WHO position paper, April 2017 – Recommendations," Vaccine, vol. 37, no. 2, pp. 219–222, 2019.

[12] M. K. Patel et al., "The changing global epidemiology of measles, 2013–2018," J. Infect. Dis., vol. 222, no. 7, pp. 1117–1128, 2020.

[13] R. Sturm and A. Hattori, "Morbid obesity rates continue to rise rapidly in the United States," Int. J. Obes., vol. 37, no. 6, pp. 889–891, 2013.

[14] T. Lobstein, "Commentary: Which child obesity definitions predict health risk?," BioMed Central, pp. 1–2, 2017.

[15] D. E. Griffin, "The immune response in measles: virus control, clearance and protective immunity," Viruses, vol. 8, no. 10, p. 282, 2016.

[16] A. Mishra et al., "Practical Observations from an Epidemiological Investigation of a Measles Outbreak in a District of India," Indian J. Community Med., vol. 34, pp. 117–121, 2009.

[17] M. S. Green, N. Schwartz, and V. Peer, "Gender differences in measles incidence rates in a multi-year, pooled analysis, based on national data from seven high-income countries," BMC Infect. Dis., vol. 22, no. 1, p. 358, 2022.

[18] Z. Khalid et al., "Insights into measles virus: Serological surveillance and molecular characterization," J. Infect. Public Health, vol. 17, no. 6, pp. 994–1000, 2024.

[19] S. L. Hughes et al., "The effect of time since measles vaccination and age at first dose on measles vaccine effectiveness – A systematic review," Vaccine, vol. 38, no. 3, pp. 460–469, 2020.

[20] C. Tran et al., "A scoping review on the associations and potential pathways between malnutrition

and measles," 2023.

[21] B. Tu et al., "Clinical and immunological analysis of measles patients admitted to a Beijing hospital in 2014 during an outbreak in China," Epidemiol. Infect., vol. 144, no. 12, pp. 2613–2620, 2016.

[22] Stevens, J. A. Herberg, and M. Levin, "Infectious Diseases and the Kidney in Children," Springer Berlin Heidelberg, pp. 1609–1654, 2016.

[23] G. Gan et al., "Vaccine-associated thrombocytopenia," Thromb. Res., vol. 220, pp. 12–20, 2022.